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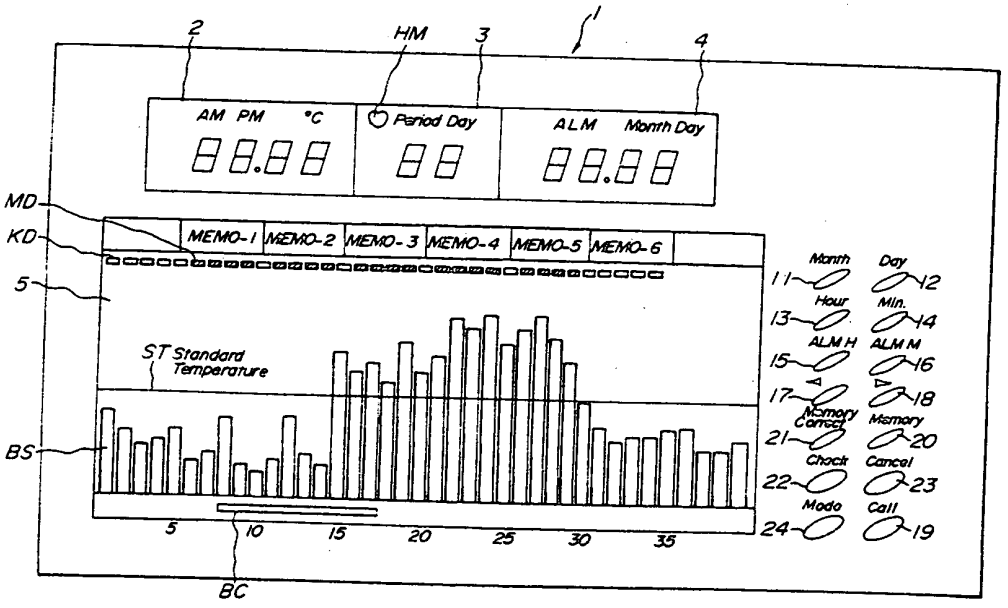
(54) Clinical thermometer for women.

(57) A clinical thermometer for women having processing function to determine day of ovulation accurately and also having function to memorize the data for several menstruation periods and to display the data when desired to guide exact diagnosis.

FIG_1



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CLINICAL THERMOMETER FOR WOMEN

The present invention relates to a clinical thermometer for women being able to effect accurate measurement of women's basal body temperature and also able to print out such data relating to birth control based on the measured basal body temperature.

There are several clinical thermometers known so far especially for women's use for measuring the basal body temperature for a certain required period and to calculate ovulation day based on the data relating to the measured basal body temperature and to indicate conceivable term being several days before and after the ovulation day.

The known women's clinical thermometer is a type to memorize the basal body temperature measured for a predetermined period, and to indicate the basal body temperature for each day unit on a display provided in the thermometer. However, it has a disadvantage in that a gynaecologist may take a little bit longer time to check the each day unit basal body temperature successively and to advise the patient accurately for birth control condition and that is difficult to exactly judge a changing date between the high temperature term and low temperature term and the ovulation day.

There are other known devices. But the operating principle or the temperature detecting algorism for the measurement of basal body temperature is rather simple. For instance, the thermometer is arranged just to memorize measured temperature immediately after a certain time lapse from the starting of the measurement of the body temperature and to take this value as the basal body temperature. Further known devices use just like the algorism of an ordinary electronic thermometer, in which a search rate temperature is previously determined from the temperature increasing curve and such a temperature is judged as the basal body temperature. Accordingly, the conventional women's clinical thermometer has a big disadvantage in that the measured basal body temperature itself is not accurate.

The present applicant had applied Japanese patent applications in this respect as follows.

(1) February 6, 1989 Application No. 26976/89
Woman's thermometer with memory functions.

(2) March 27, 1989 Application No. 74702/89
Woman's thermometer with function of calculating area of corpus luteum.

(3) May 22, 1989 Application No. 128484/89
Woman's thermometer with indicating function for birth control.

(4) July 24, 1989 Application No. 191,201/89
Woman's thermometer.

Each of the above four applications relates thermometer of rather particular use. Under the situation a thermometer having indicating function and for general use had been desired.

The present invention has for its object to solve the above mentioned problems of the prior art devices. In the present invention, an arrangement has been made to be able to accurately measure the basal body temperature in addition to print out the total birth control data related to and based on the basal body temperature measured and memorized for a certain period of time and by indicating the data by digital values or graphs so that the gynaecologist can make diagnosis properly.

In order to achieve the above mentioned object, the present invention is characterized in that it comprises

calendar function means,

detecting means for detecting body temperature of a woman to be supervised by using a temperature detector,

temperature measuring means being supplied at its input a signal from said body temperature detecting means to recognize the detected body temperature and to judge basal body temperature under condition that variation of detected body temperature for a predetermined period is within a previously set permissible temperature range after judging the detected temperature had exceeded a predetermined temperature or the time lapsed from the starting the measurement of the body temperature had exceeded by a highest detected temperature during said predetermined period,

body temperature memory means for memorizing said basal body temperature judged by said temperature measuring means together with a day of period of menstruation of the woman under checking,

processing means for calculating data related to birth control based on the basal body temperature for a desired period memorized in the body temperature memory means, and to memorize it,

display means for displaying the basal body temperature memorized in the body temperature memory means in the menstruation period unit and for indicating said data relating to birth control memorized in said processing means, and

output means for sending out a print out signal for printing said basal body temperature and the data relating to birth control based on said basal body temperature by using a printer.

According to the women's clinical thermometer having the above construction, the temperature measuring means recognize the detected body temperature by an input signal from the body temperature detector, and after judging a fact that the

detected body temperature had exceeded a predetermined temperature and that variation of the detected body temperature lies within a preset permissible temperature range, or a time lapsed from the start of measurement of the body temperature had exceeded a predetermined time, the highest detected temperature detected during the said predetermined period is judged as the basal body temperature. The body temperature memory means memorize the basal body temperature measured as above together with calendar date and the date of menstruation period. Further the indicating means display the basal body temperature memorized in the body temperature memory means by a unit of menstruation period and also indicate the data relating to birth control. The output means delivers out the print out signal for the printer for recording and printing out the data related to the birth control based on the basal body temperature.

For a better understanding of the invention, reference is taken to the accompanying drawings, in which:

Fig. 1 shows a panel surface diagram of the women's clinical thermometer according to the present invention, and

Fig. 2 shows a block diagram of an electronic circuit of the same women's thermometer.

The invention will now be explained by referring to the accompanying drawings.

Fig. 1 shows plan view of the panel surface of women's clinical thermometer for explaining arrangement of various parts of the device.

As can be seen from Fig. 1, on the panel surface of the women's thermometer 1 there is provided with a first indicator 2, formed of LCD (liquid crystal display), which indicates the real time in the normal indication condition with indication for AM and PM to indicate before noon or after noon. In the measuring condition of the device, this first indicator 2 acts to indicate the measured body temperature of a woman by numerals judged by a body temperature measuring algorism which will be explained in detail hereinafter. Adjacent to this first indicator 2, there is provided with a second LCD indicator 3 including a heart mark HM which will be turned on when a pregnancy condition is judged based on the basal body temperature which also will be explained later. This indicator 3 further includes an indication for the number of day in a menstruation period making the initial day of the menstruation period as the first day. Adjacent to this second indicator 3, there is a third indicator 4 which indicates in its ordinary indicating condition, the calendar month and calendar day of the day using the device and an alarm indication which operates at a preset alarm time to notify by an indication of characters "ALM" for a certain period. This portion operates to indicate the due date during turning on of said heart mark "HM" for indicating pregnancy condition and a switch 12, which will be explained later, is depressed. In said preset alarm time, a buzzer 38, which also will be explained later, operates to produce buzzer tone for a predetermined period so that the body temperature is to be measured within a term one hour before and after the buzzer tone and this temperature measuring data is memorized in a micro-computer which will be explained later.

The temperature measuring algorism for determining the basal body temperature is as follows.

(1) The detected woman's body temperature measured by a body temperature detector 30 (refer to Fig. 2) had exceeded 35° C.

(2) After exceeding 35° C of the detected woman's body temperature, the variation range of the detected temperature reached less than 0.02° C within thirty second.

(3) In the above items (1) and (2), if the detected temperature falls down more than 0.2° C, a temperature measuring error is concluded.

(4) Both the above items (1) and (2) are satisfied, a buzzer 38 (refer to Fig. 2) is energized to produce signal tone to indicate completion of the temperature measurement and the highest temperature in the above item (2) is judged as the basal body temperature and this temperature is memorized in the memory RAM (Fig. 2). However, if the above measurement completion time is less than five minutes, the temperature measurement is to be continued and the highest temperature after a lapse of five minutes from the starting of this temperature measurement is assumed as the basal body temperature and this value is memorized in the memory RAM 32 and a completion signal tone different from the above temperature measurement completion tone is produced.

Underneath the above mentioned first indicator 2, the second indicator 3 and the third indicator 4, there is provided with a graphic display 5 for indicating the basal body temperature BS of the woman by a vertical line graph measured for each successive day of the woman's menstruation period. The graphic display 5 also indicates by a horizontal line the standard temperature ST which is a mean value between the mean body temperature of the lower temperature period and the mean body temperature of higher body temperature period. This graphic display 5 has its indicating portion formed of LCD dots. Each indicating line for BS corresponds to each successive day of a menstruation period and extends in vertical direction and having, for instance, 27 dots, of which each dot corresponding to 0.05° C unit, for instance. At about middle of the vertically extending temperature indicating dots, there is one horizontal dot line

for indicating the standard temperature ST. Further, under the temperature indicating dots for BS, there is a birth control period indicating dot BC extending in one horizontal line.

At upper side of the body temperature indicating dots (BS), there are memo indicating dots MD, i.e. MEMO-1, MEMO-2, --- MEMO-6, arranged in one lateral row. These memo dots MEMO-1 to MEMO-6 are used to indicate memory items being important predetermined diagnostic information for the gynaecologist in the diagnosis and guidance for women relating to control of conceiving. This information is for instance, bleeding condition, menorrhagia, discharge from the womb (hereinafter simplified by discharge), sexual intercourse, attack of fever, doping of drugs like ovulation promoter, etc. Such information can be memorized by operating corresponding keys or switches each provided for each items. In order to individually indicate the above memo items of the above memo indicating dots MD, indication of MEMO-1, MEMO-2, MEMO-3, MEMO-4, MEMO-5 and MEMO-6 are provided at top outside of the graphic display 5 as shown in Fig. 1. The indication may mean by followings.

MEMO-1 ----- bleeding
MEMO-2 ----- meno-rrhagia
MEMO-3 ----- discharge
MEMO-4 ----- intercourse
MEMO-5 ----- fever
MEMO-6 ----- doping

At right hand of the graphic display 5 there are arranged various controlling push button switches.

As can be seen from Fig. 1, said controlling push button switches are arranged in two columns each having six switches and altogether twelve switches. At the top of the columns, a switch 11 for setting calendar "month' and a switch 12 for setting calendar "day" are arranged. Below this row, a switch 13 for setting "hour" in 24 hour indication and a switch 14 for setting "minute" are arranged. Further below this row, a switch 15 for setting "hour" of alarm time for notifying a time to measure the body temperature to a person under supervision by alarm and a switch 16 for setting "minute" of the alarm time. Also a left shift switch 17 for shifting the measured body temperature displayed by the graph line BS on the graphic display 5 at each periodical day towards left and a right shift switch 18 to shift the display towards right at each day by day.

Furthermore, six control switches are arranged as shown in Fig. 1. These switches are as follows.

call switch ----- 19
memory switch ----- 20
memory correct switch ----- 21
check switch ----- 22
cancel switch ----- 23
mode switch ----- 24

A call switch 19 located at extreme bottom right is used to call the measured temperature data memorized in the RAM 32 of a micro-computer 31 which will be explained hereinafter for a week unit by each file by file beginning from the newest file and to indicate the content of the file by the line graph BS on the graphic display 5 so as to place in "call condition". By once depressing this call switch 19, the body temperature measuring data under proceeding is called out to display it by the line graph BS. This data is displayed by making the left end line graph BS as the initial day of the menstruation and the lines towards right direction indicate that for more recent date of the cycle. When depressing the call switch 19 once more, a temperature measuring data of the previous file is indicated.

There is also a memory switch 20 as shown in the drawing. When this memory switch 20 is depressed, the date indicated on the third indicator portion 4 in the ordinary indicating condition is registered in the RAM 32 as the most recent initial day of the menstruation and the graphic display 5 becomes said call condition. However, if this date is not passed over 10 days counted from the initial day of the previous menstruation period, such date is not registered as the new initial date of the menstruation period.

When the memory correction switch 21 is depressed, the indicated date showing the first day of the most recent menstruation period on the third indicator 4 registered by said memory switch 20 will start to turn on an off. At the same time, the indicating portion for the temperature of the first indicator 2 and that for the day of a certain menstruation period of the second indicator 3 become blank and the graphic display 5 also becomes blank. At this condition, the first date of the menstruation period can be changed to the date desired by using the switches 11 and 12 and referring to the third indicator 4. After setting the desired date, the memory correction switch 21 may be depressed. Then the turning on and off of the date indication on the third indicator 4 is discontinued and this date is registered as the corrected initial date of the newly corrected term.

The check switch 22 acts as follows. When this check switch 22 is depressed in said call condition, temperature indicting dot BS on the extreme left side of the graphic display 5 starts to turn on and off at a period of 0.4 sec±0.1 sec for a duration of 5 sec±0.5 sec and corresponding data, i.e. temperature, day of the period, and the first day of the menstruation period are indicated on the first indicator 2, second indicator 3, and fourth indicator 5, respectively. When the turning on and off of the extreme left dot BS on the graphic display 5, the next dot on the right will start to turn on and off to

indicate the same data as above to proceed to show successive indication until the extreme right end and the temperature, day of period and the first day of the menstruation period are likewisely indicated.

The cancel switch 23 acts to stop all the processes then undergoing and to restore to the ordinary indicating condition, when it is depressed. Also it acts to delete the most recently registered body temperature measuring data among the memorized data in RAM 32. However, this deletion is limited to a condition that the device is in the ordinary indicating condition, that the time lapsed from the most recent body temperature measurement is not exceeding more than 5 minutes±15 seconds, and that the body temperature measuring data is the first measurement within one hour before and after of said alarm time. Furthermore, an erroneously registered memory of the first date of a menstruation period can be cancelled as far as the registered memory data is under correction condition.

The mode switch 24 acts to secure the operation of other switches 11-23 when it is depressed simultaneously with one of said other switches to make the operation of other switches definite. In other words, to eliminate an erroneous operation of said other switches when contacted unintentionally and to secure the result of operation definitely only when these switches are operated under object by backing up the controlling signal.

The thermometer 30 shown in Fig. 2 and used for measuring the body temperature of a person to be supervised has a temperature measuring switch 30S, which is to be depressed at the time to start the measurement.

Now, an electronic circuit block diagram shown in Fig. 2 will be explained.

As shown in Fig. 2, as a most essential part of the electronic circuit of the women's thermometer a micro-computer 31 is provided. This micro-computer 31 comprises a central processing unit (CPU) 31A, said RAM 32, a ROM 33 accommodating various processing programs, an input interphase 34, and an output interphase 35.

To the above mentioned input interface 34, the various switches explained in the above are connected. Also a temperature detector 30 used in the measurement of body temperature of a woman is coupled via an A/D converter 36. To this A/D converter and to the input interphase, the above mentioned temperature measuring switch 30S is connected, which is associated with and accommodated in the base of the temperature detector 30.

Whereas to the output interphase 35, an LCD driver circuit 37 is connected used to drive said first indicator 2, second indicator 3, third indicator 4 and the graphic display 5, respectively. Also a buzzer 38 to produce a buzzer tone at the alarm time or at the operation time of said switches 11-24 is connected to the output interphase 35.

The output interphase 35 comprises a printer connecting interphase for connecting printer 40 for typing out various data being input to the micro-computer 31 and memorized in it.

As for the data to be printed out by the printer 40 there are basal body temperature of maximum six periods and the measured date, first date of the menstruation period, ovulation day, date of birth control, said memo items, data for pregnancy, etc.

The function of the device to judge pregnancy based on the basal body temperature to turn on said heart mark HM, to calculate the due date based on the ovulation day and to display such data will now be explained.

Based on the measured basal body temperature, after the low temperature period when there is more than 21 days of high temperature period, the micro-computer 31 judges as pregnancy condition and turns on the heart mark HM from the 21st day until first day of the next menstruation period.

The micro-computer 31 decides the ovulation day based on the following condition.

(1) More than 7 days have lapsed from the first day of menstruation.

(2) The body temperature measured on the day is higher than the standard temperature ST and the measured body temperature is higher than the lowest body temperature in the menstruation period by 0.3°C for 3 consecutive days including the same day.

If both the above two conditions are fulfilled, 4th days counted before this day is assumed as the ovulation day and memorized in the RAM 32.

Then by taking the ovulation day decided in the above process as the first day, a calculated 266th day is deemed as the due date and it is memorized in the RAM 32. Under the condition that the heart mark HM is turned on, when said day switch 12 is depressed, the above due date is indicted on said third indicator 4.

According to the present invention, the basal body temperature can be measured accurately by the temperature measuring algorism in the temperature measuring means. Also the basal body temperature measured and memorized for a desired period and the birth control data calculated by said basal body temperature can be printed out altogether when desired and it can be displayed or recorded by digital value or graphic display. Accordingly, a woman who is the subject to check the body temperature can immediately recognize the change of basal body temperature of herself and the birth control data. The gynaecologist can provide exact diagnosis or advice based on the displayed data relating to the birth control.

Claims

1. A clinical thermometer for women comprising in combination,
calendar function means,
detecting means for detecting body temperature of a woman to be supervised by using a temperature detector,
temperature measuring means being supplied at its input a signal from said body temperature detecting means to recognize the detected body temperature and to judge basal body temperature under condition that variation of detected body temperature for a predetermined period is within a previously set permissible temperature range after judging the detected temperature had exceeded a predetermined temperature or the time lapsed from the starting the measurement of the body temperature had exceeded by a highest detected temperature during said predetermined period,
body temperature memory means for memorizing said basal body temperature judged by said temperature measuring means together with a day of period of menstruation of the woman under checking,
processing means for calculating data related to birth control based on the basal body temperature for a desired period memorized in the body temperature memory means, and to memorize it,
display means for displaying the basal body temperature memorized in the body temperature memory means in the menstruation period unit and for indicating said data relating to birth control memorized in said processing means, and
output means for sending out a print out signal for printing said basal body temperature and the data relating to birth control based on said basal body temperature by using a printer.

2. A clinical thermometer as claimed in claim 1 wherein the predetermined temperature is about 35 °C.

3. A clinical thermometer as claimed in claim 1 wherein the variation range of the detected temperature is less than 0.02 °C within about thirty seconds.

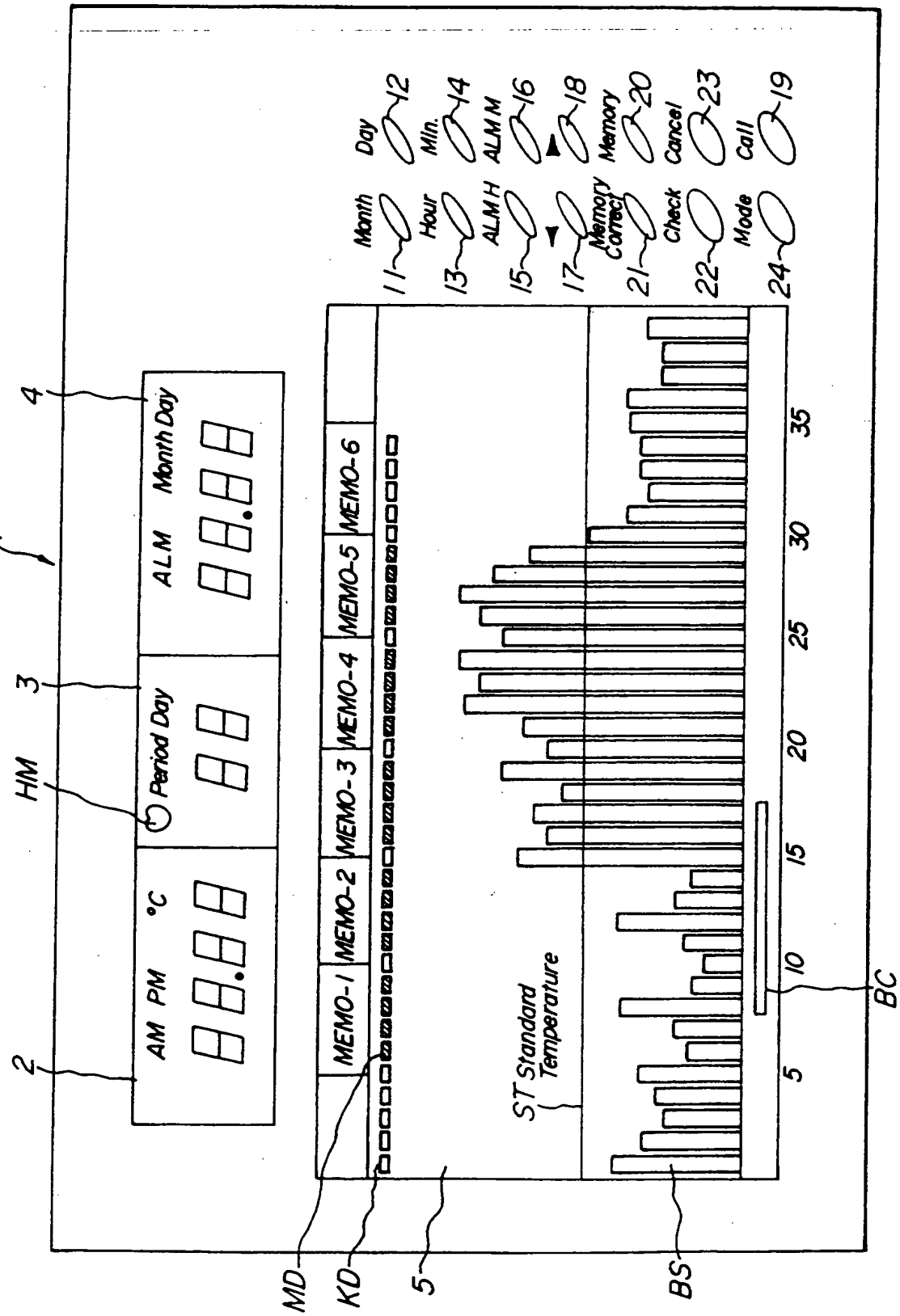
4. A clinical thermometer as claimed in claim 1 wherein the predetermined period is about 5 minutes.

5. A clinical thermometer as claimed in claim 1 wherein the basal body temperature is memorised in the RAM 32 of a micro-computer.

6. A clinical thermometer as claimed in any one of the preceding claims wherein the body temperature is measured within a term one hour before and one hour after a preset alarm time.

7. A clinical thermometer for women comprising a means arranged to measure and determine a basal body temperature, processing means for calculating data related to birth control based on the basal body temperature for a desired period and showing means.

FIG_1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HM
AM PM °C
Period Day
ALM Month Day
MEMO-1
MEMO-2
MEMO-3
MEMO-4
MEMO-5
MEMO-6
Month
Hour
ALM H
Memory Correct
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Mode
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Memory
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ST Standard Temperature
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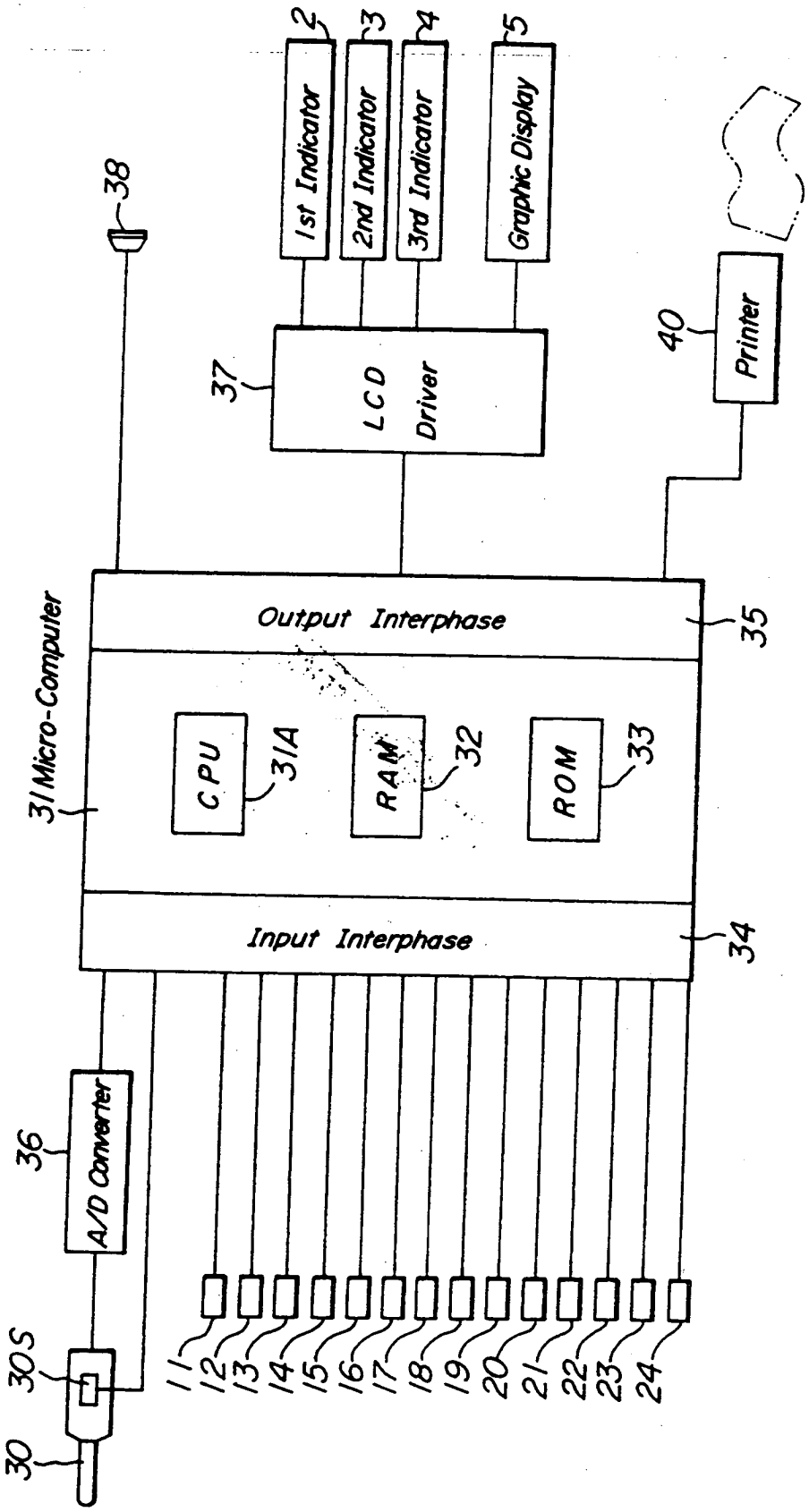
FIG_2


2
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1st Indicator
2nd Indicator
3rd Indicator
Graphic Display
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37
LCD Driver
40
Printer
Output Interphase
35
31 Micro-Computer
CPU
31A
RAM
32
ROM
33
Input Interphase
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A/D Converter
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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 90311337.1

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	AT - B - E 19 552 (ARES N.V.) * Page 2, paragraph 4 - page 6; page 9, paragraph 4 - page 11; fig. 1 *	1,2,5, 6,7	G 01 K 13/00 A 61 B 10/00
X	DE - A1 - 3 606 249 (BENYTONE CORP.) * Column 2, line 27 - column 5; fig. 1,2 *	1,5,7	
X	DD - A - 141 355 (LUDWIG) * Abstract; page 5, line 33 - page 7; fig. 2,3 *	1,4,5, 6,7	
A	GB - A - 2 092 340 (SHARP) * Fig. 2-6,9(A)-9(D); page 1, line 60 - page 3, line 9; page 5, line 46 - page 6, line 51 *	1,2,4, 7	
A	EP - A2 - 0 168 640 (OMRON) * Fig. 4,5; page 17 - page 20, line 3 *	1,3	TECHNICAL FIELDS SEARCHED (Int. Cl.5) G 01 K 1/00 G 01 K 13/00 A 61 B 10/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	09-01-1991	BURGHARDT

CATEGORY OF CITED DOCUMENTS

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